What is claimed is:

1. A method for detecting nucleic acid target sequences in a sample comprising:

contacting a sample of nucleic acids with an oligonucleotide probe under conditions favorable for hybridization, the oligonucleotide probe having a sequence at least partially complementary to a target nucleic acid sequence to be detected, the oligonucleotide probe including a fluorescent reporter molecule and a quencher molecule capable of quenching the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one single-stranded conformation when unhybridized where said quencher molecule quenches the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one conformation when hybridized to said target polynucleotide where the fluorescence intensity of said reporter molecule when said oligonucleotide probe is hybridized to said target polynucleotide is greater than the fluorescence intensity of said reporter molecule when said oligonucleotide probe is not hybridized to said target polynucleotide;

and

monitoring the fluorescence of said reporter molecule, an increase in the fluorescence intensity of the reporter molecule indicating the presence of the target sequence.

2. The method according to claim 1 wherein the fluorescence intensity of said reporter molecule when said oligonucleotide probe is hybridized to said target polynucleotide is at least about a factor of 6 greater than the fluorescence intensity of said said reporter molecule when said oligonucleotide probe is not hybridized to said target polynucleotide.

46

target nucleic acid sequence to be detected, the oligonucleotide probe including a fluorescent reporter molecule and a fluorescent quencher molecule capable of quenching the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one single-stranded conformation when unhybridized where said quencher molecule quenches the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one conformation when hybridized to said target polynucleotide where the fluorescence of said reporter molecule is unquenched, the fluorescence intensity of said reporter molecule being greater than the fluorescence intensity of said quencher molecule when said probe is hybridized to said target polynucleotide;

and

monitoring the fluorescence of said reporter molecule, an increase in the fluorescence intensity of the reporter molecule indicating the presence of the target sequence.

38. The method according to claim 37 wherein the fluorescence intensity of said reporter molecule is at least about a factor of 3.5 greater than the fluorescence intensity of said quencher molecule when said probe is hybridized to said target polynucleotide.

39. A method for detecting nucleic acid target sequences in a sample comprising:

contacting a sample of nucleic acids with an oligonucleotide probe attached to a solid support under conditions favorable for hybridization, the oligonucleotide probe having a sequence at least partially complementary to a target nucleic acid sequence to be detected, the oligonucleotide probe including a fluorescent reporter molecule and a fluorescent quencher molecule capable of quenching the fluorescence of said reporter molecule,

said oligonucleotide probe existing in at least one single-stranded conformation when unhybridized where said quencher molecule quenches the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one conformation when hybridized to said target polynucleotide where the fluorescence of said reporter molecule is unquenched, the ratio of the fluorescence intensities of said reporter molecule to said quencher molecule when said probe is hybridized to said target polynucleotide is greater than the ratio of the fluorescence intensities of said reporter molecule to said quencher molecule when said probe is single-stranded;

and

monitoring the fluorescence of said reporter molecule, an increase in the fluorescence intensity of the reporter molecule indicating the presence of the target sequence.

40. The method according to claim 39 wherein the the ratio of the fluorescence intensities of said reporter molecule to said quencher molecule when said probe is hybridized to said target polynucleotide is at least about a factor of 6 greater than the ratio of the fluorescence intensities of said reporter molecule to said quencher molecule when said probe is single-stranded.

3. The method according to claim 1 wherein said reporter molecule is separated from said quencher molecule by at least about 15 nucleotides.

4. The method according to claim 3 wherein said reporter molecule is separated from said quencher molecule by between about 15 and 60 nucleotides.

5. The method according to claim 1 wherein said reporter molecule is separated from said quencher molecule by at least about 18 nucleotides.

6. The method according to claim 5 wherein said reporter molecule is separated from said quencher molecule by between about 18 and 30 nucleotides.

7. The method according to claim 1 wherein the reporter molecule is attached to a 3' terminal nucleotide of the probe.

8. The method according to claim 7 wherein the quencher molecule is attached to a 5' terminal nucleotide of the probe.

9. The method according to claim 1 wherein the reporter molecule is attached to a 5' terminal nucleotide of the probe.

10. The method according to claim 9 wherein the quencher molecule is attached to a 3' terminal nucleotide of the probe.

11. The method according to claim 1 wherein the quencher molecule is attached to a 3' terminal nucleotide of the probe.

12. The method according to claim 1 wherein the quencher molecule is attached to a 5' terminal nucleotide of the probe.

13. The method according to claim 1 wherein said nucleic acid polymerase is a thermostable nucleic acid polymerase.

14. The method according to claim 1 wherein said reporter molecule is a fluorescein dye and said quencher molecule is a rhodamine dye.

15. A method for detecting nucleic acid target sequences in a sample comprising:

contacting a sample of nucleic acids with an oligonucleotide probe under conditions favorable for hybridization, the oligonucleotide probe having a sequence at least partially complementary to a target nucleic acid sequence to be detected, the oligonucleotide probe including a fluorescent reporter molecule and a fluorescent quencher molecule capable of quenching the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one single-stranded conformation when unhybridized where said quencher molecule quenches the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one conformation when hybridized to said target polynucleotide where the fluorescence of said reporter molecule is unquenched, the fluorescence intensity of said reporter molecule being greater than the fluorescence intensity of said quencher molecule when said probe is hybridized to said target polynucleotide;

and

monitoring the fluorescence of said reporter molecule, an increase in the fluorescence intensity of the reporter molecule indicating the presence of the target sequence.

16. The method according to claim 15 wherein the fluorescence intensity of said reporter molecule is at least about a factor of 3.5 greater than the fluorescence intensity of said quencher molecule when said probe is hybridized to said target polynucleotide.

17. A method for detecting nucleic acid target sequences in a sample comprising:

contacting a sample of nucleic acids with an oligonucleotide probe under conditions favorable for hybridization, the oligonucleotide probe having a sequence at least partially complementary to a target nucleic acid sequence to be detected, the oligonucleotide probe including a fluorescent reporter molecule and a quencher molecule capable of quenching the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one single-stranded conformation when unhybridized where said quencher molecule quenches the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one conformation when hybridized to said target polynucleotide where the fluorescence of said reporter molecule is unquenched, the ratio of the fluorescence intensities of said reporter molecule to said quencher molecule when said probe is hybridized to said target polynucleotide is greater than the ratio of the fluorescence intensities of said reporter molecule to said quencher molecule when said probe is single-stranded;

and

monitoring the fluorescence of said reporter molecule, an increase in the fluorescence intensity of the reporter molecule indicating the presence of the target sequence.

18. The method according to claim 17 wherein the ratio of the fluorescence intensities of said reporter molecule to said quencher molecule

when said probe is hybridized to said target polynucleotide is at least about a factor of 6 greater than the ratio of the fluorescence intensities of said reporter molecule to said quencher molecule when said probe is single-stranded.

19. A method for detecting nucleic acid target sequences in a sample comprising:

contacting a sample of nucleic acids with an oligonucleotide probe attached to a solid support under conditions favorable for hybridization, the oligonucleotide probe having a sequence at least partially complementary to a target nucleic acid sequence to be detected, the oligonucleotide probe including a fluorescent reporter molecule and a quencher molecule capable of quenching the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one single-stranded conformation when unhybridized where said quencher molecule quenches the fluorescence of said reporter molecule, said oligonucleotide probe existing in at least one conformation when hybridized to said target polynucleotide where the fluorescence intensity of said reporter molecule when said oligonucleotide probe is hybridized to said target polynucleotide is greater than the fluorescence intensity of said reporter molecule when said oligonucleotide probe is not hybridized to said target polynucleotide;

and

monitoring the fluorescence of said reporter molecule, an increase in the fluorescence intensity of the reporter molecule indicating the presence of the target sequence.

20. The method according to claim 19 wherein the fluorescence intensity of said reporter molecule when said oligonucleotide probe is hybridized to said target polynucleotide is at least about a factor of 6 greater than the

fluorescence intensity of said reporter molecule when said oligonucleotide probe is not hybridized to said target polynucleotide.

21. The method according to claim 19 wherein said reporter molecule is separated from said quencher molecule by at least about 15 nucleotides.

22. The method according to claim 21 wherein said reporter molecule is separated from said quencher molecule by between about 15 and 60 nucleotides.

23. The method according to claim 19 wherein said reporter molecule is separated from said quencher molecule by at least about 18 nucleotides.

24. The method according to claim 23 wherein said reporter molecule is separated from said quencher molecule by between about 18 and 30 nucleotides.

25. The method according to claim 19 wherein the reporter molecule is attached to a 3' terminal nucleotide of the probe.

26. The method according to claim 25 wherein the quencher molecule is attached to a 5' terminal nucleotide of the probe.

27. The method according to claim 19 wherein the reporter molecule is attached to a 5' terminal nucleotide of the probe.

28. The method according to claim 27 wherein the quencher molecule is attached to a 3' terminal nucleotide of the probe.

29. The method according to claim 19 wherein the quencher molecule is attached to a 3' terminal nucleotide of the probe.

30. The method according to claim 19 wherein the quencher molecule is attached to a 5' terminal nucleotide of the probe.

31. The method according to claim 19 wherein said reporter molecule is a fluorescein dye and said quencher molecule is a rhodamine dye.

32. The method according to claim 19 wherein the probe is attached to the solid support by a linker.

33. The method according to claim 32 wherein the linker separates the probe from the solid support by at least 30 atoms.

34. The method according to claim 33 wherein the linker separates the probe from the solid support by at least 50 atoms.

35. The method according to claim 32 wherein the linker is a functionalized polyethylene glycol.

36. The method according to claim 35 wherein the linker is a polynucleotide.

37. A method for detecting nucleic acid target sequences in a sample comprising:

contacting a sample of nucleic acids with an oligonucleotide probe attached to a solid support under conditions favorable for hybridization, the oligonucleotide probe having a sequence at least partially complementary to a